# PATENT SPECIFICATION

DRAWINGS ATTACHED

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*Date of filing Complete Specification: July 13, 1965.*

*Application Date: July 15, 1964.* No. 29178/64

*Complete Specification Published: January 3, 1968.*



Index at Acceptance:—F1 R3A3D.

Int. Cl.:—F 04 f 1/06.

COMPLETE SPECIFICATION

## Improvements in or relating to actuators for pressurised aerosol dispensing containers

We, NEOTECHNIC ENGINEERING LIMITED, a British Company of Kendal Street, Clitheroe, Lancashire, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is for improvements in or relating to actuators for pressurised aerosol dispensing containers and has for an object to provide a device which will totally enclose the container and will actuate the valve, otherwise than by depressing a button secured directly to the valve stem.

The invention is particularly concerned to provide an actuator for use with small pressurised aerosol dispensing containers utilised for dispensing measured doses of pharmaceuticals intended for administration by spraying into the nasal or oral cavities. The conventional pressurised aerosol dispensing containers have a spring-loaded valve stem which is conveniently associated with an actuator button, the operation being effected by holding the container in a fixed position, either in the hand or in a container, and depressing the actuator button so as to move the valve stem to release the charge or aerosol composition, the valve stem being returned to its initial position by the spring on release of the actuator button.

According to the present invention there is provided an actuator for pressurised aerosol dispensing containers which have a discharge valve actuated by axial displacement of a valve stem, comprising an elongated stationary member formed with a recess adapted to receive and locate a pressurised aerosol dispensing container, a movable member mounted on said stationary member and arranged to be movable transversely of the longitudinal axis thereof, by means of a squeezing action on the stationary and movable members where they surround the dispensing container, and conversion means adapted to convert transverse movement of said movable member into axial movement to exert pressure on said container along the longitudinal axis of the said stationary member to move it axially thereof, said stationary member having an abutment at or near the upper end of the recess to engage with the stem of the valve of the container to retain it against axial movement during axial movement of the container. One form of conversion means in accordance with this invention comprises cam means carried on, or actuated by, said movable member, said cam means being so located as to engage the base of a pressurised aerosol dispensing container held in the stationary member and adapted to push it axially thereof. It will be appreciated that with the actuator of the present invention, it is the body of the container itself which is moved, whilst the valve stem is held stationary in contrast with the conventional arrangement in which it is the valve stem which is moved. A variety of cam means may be employed and according to a feature of the invention a convenient cam means is constituted by a wedge-shaped member carried on the lower end of the movable member. The wedge-shaped member is, of course, so located as to engage with the base of the container in such a way that, on transverse movement of the movable member, the wedge-shaped member moving towards the centre of the elongated member, forces the container axially towards the upper end of the elongated member.

The invention provides an alternative form of cam means constituted by slots

formed in the elongated stationary member and movable member, said slots being disposed at an angle to one another and having a bar engaging with both slots and passing transversely across the lower end of the elongated stationary member in a position to engage with the base of the container, the slots being so arranged that, on transverse movement of the movable member towards the centre of the elongated stationary member, the bar is caused to move towards the upper end of the elongated stationary member pushing a pressurised aerosol dispensing container disposed therein axially towards the upper end, by virtue of the sliding motion of the bar in the two slots; the bar conveniently is provided with a flat disc abutting against the base of the container.

The upper end of the elongated stationary member is, of course, provided with an outlet for the discharged aerosol composition, the outlet being appropriately located in relation to the position taken by the valve stem of the container when it is positioned within the actuator. Conveniently, the outlet is formed by a nozzle mounted in the upper end of the elongated stationary member which may be in the form of a screw-threaded nozzle permitting the use of a variety of nozzles to suit the particular requirements, for example, for a nasal or an oral spray; the inner end of a nozzle may constitute the abutment against which the open end of the valve stem of the container rests when it is positioned within the actuator.

In order that the nature of the invention may be fully understood, it will now be described in relation to the three embodiments which will illustrate the manner in which the invention may be carried into effect, reference being made to the accompanying drawings in which:—

Figure 1 is a side elevation of one embodiment of actuator in accordance with the invention;

Figure 2 is a cross-section along the line II-II of Figure 1;

Figure 3 is a cross-section along the line III-III of Figure 1;

Figure 4 is a cross-section along the line IV-IV of Figure 2;

Figure 5 is a side elevation of a second embodiment of the invention;

Figure 6 is a cross-section along the line VI-VI of Figure 5;

Figure 7 is a part sectional view of the upper portion of an actuator illustrating the provision of an adaptor;

Figure 8 is a cross-section along a vertical axis of a third embodiment, and

Figure 9 is an enlarged view of the actuating mechanism of the construction of Figure 8, in cross-section.

In the first embodiment of actuator to be described, there will be seen from Figures 1 and 2 a construction in which there is provided a stationary member 1 which is formed to be somewhat trough-like in shape in order to provide a receptacle within which a pressurised aerosol dispensing container can be received. A second movable member 2 is mounted upon the stationary member 1 by means of projecting spigot-like members 3 engaging in complementary holes 4 in the upper body part 5 of the stationary member 1. The movable member 2 swings sideways about the pivot formed by the spigot members 3 so that the lowermost part of the movable member 2 has a transverse movement across the bottom of the open end of the trough in the stationary member 1.

A discharge orifice is formed at 6 in the upper part 5 of the stationary member 1 and the upper end of the trough-shaped recess is formed with a tapering surface 7 and a flat end 8.

The discharge orifice 6 is in two different diameters, the larger diameter communicating directly with the interior of the trough-like recess and the diameter of the outermost part of the orifice 6 is such that there is formed an abutment for the open end of the discharge valve from the container.

At the bottom end of the movable member 2 there is an end-portion 9 partly closing the open end of the movable member 2 which, as is readily seen from Figure 3, is itself trough-like in character. A wedge-like cam member 10 is formed to lie on the surface of the end portion 9 and against the side walls thereof, as can be seen in each of Figures 1 and 2. A similar wedge-like cam member 10, facing that on the end portion 9, is formed on the lower end of the stationary member 1.

It will readily be seen that with the container disposed within the trough-like recess of the stationary member 1, movement of the movable member 2, by squeezing in the hand, forces the member 2 towards the left (as seen in Figure 1) thereby causing the wedge-like surfaces of the cam members 10 to engage with the base of the container and force it axially upwards so that the body of the container is caused to move relatively to the open discharge stem of the valve, whereby the contents of the container are vented through the orifice 6.

If desired, the orifice 6 may be screw-threaded so that nozzles or adaptors may be affixed to the end 5 of the stationary member 1.

In the second embodiment of actuator seen in Figures 5 and 6, there is provided an open-ended elongated tubular stationary member 1 which is open at one end and is

of a length and diameter such as to accommodate wholly within the stationary member 1 the whole length of a conventional pressurised aerosol dispensing container with its protruding valve. At the bottom, open end of the stationary member 1, two slots 14 are formed on opposite sides of the stationary member 1 to extend parallel to its longitudinal axis, the length of the slots 14 being greater than the distance of movement of the valve stem of the container during actuation.

A movable member 2 is formed as a U-shaped element which extends around the exterior of the stationary member 1 and which is pivotally mounted thereon at the upper end of the stationary member 1 in the same manner as described with reference to the first embodiment. At its lower end, the U-shaped movable member 2 has a transverse dimension greater than the diameter of the stationary member 1 and is formed with two inclined slots 13 extending, from near to its bottom end, in a direction inclined upwardly towards the upper end thereof.

A bar 11 is provided which extends across the diameter of the stationary member 1 and which is located in the slots 14 therein and which is of a length such that its ends 12 extend into engagement with the inclined slots 13 formed in the U-shaped movable member.

The bar, which may carry a disc (not shown) which is a sliding fit in the interior of the stationary member 1, will engage either directly or via the disc (when this is provided) with the base of a pressurised aerosol dispensing container, and will be seen to be axially reciprocable within the stationary member and will be capable of forcing the aerosol container axially of the stationary member when it is moved by the action of the bar 11 sliding in the inclined slots 13 of the movable member 2 when that member is moved about its pivot point 3 to swing across the bottom end of the stationary member 1, causing the bar 11 to ride up the inclined slots 13 and longitudinal slots 14 formed in the movable member 2 and stationary mmeber 1 respectively.

At the upper end 5 of the stationary member 1, there is formed an orifice 6 of two different diameters, such that the widest part will accommodate the open end of the valve stem of a pressurised aerosol dispensing container through which its contents are discharged whilst the narrowest part forms an abutment against which the end of the valve stem engages.

It will be appreciated that with the actuator held in the hand, a squeezing action will cause the U-shaped movable member 2 to pivot, thus bringing about the axial movement of the container and effecting the necessary relative axial movement between the container and its valve stem to effect an actuation of the valve and a discharge of the contents of the container.

In the construction illustrated in Figures 1 to 6 the open end of the container valve fits into the orifice 6 which is formed in two parts of differing diameters, thus providing a unitary nozzle end to the adaptor. Instead of constructing the adaptor in this way, there may be provided the construction illustrated in Figure 7. In this figure it will be seen that the upper end 5 of the tubular member is formed with a larger central orifice than is the case in the construction of Figures 1 to 6 and an adaptor 15 formed with a discharge orifice 16 and a skirt 17 is made a push-fit over the exterior of the upper end 5 of the tubular member and being held in position by means of a ring 18 which engages with a circumferential groove 19 fromed around the circumference of the upper end 5. This adaptor 15 is formed with a central axial orifice 21 which has successive parts of three differing diameters, the largest of which is in the lowest portion 20 of the adaptor 15 of a size to receive the end of the valve stem 25 of a pressurised aerosol dispensing container. The smallest diameter is disposed so as to communicate directly into the discharge orifice 16 of the adaptor 15.

Surrounding the entry of the orifice 21 into the discharge orifice 16 are a number of bleed holes 22 whcih communicate with an annular space 23 formed between the interior surface of the upper end 5 and the exterior surface of the part 20 of the adaptor. The body 24 of the container is end-disposed within the recess formed in the stationary member 1.

Instead of the construction shown in Figure 7, it will, of course, be understood that a screw-threaded nozzle member may be provided to engage with a corresponding screw-thread formed in the end 5 of the tubular member.

A further alternative construction of actuator is illustrated in Figure 8. In this construction, the stationary member 1 is substantially the same as illustrated in the preceding Figure but in this construction there are provided two movable members 26, each of which, like the movable members 2 in the construction of Figures 1 to 6, are pivoted near their upper ends so as to move transversely of the stationary member 1 at their lower ends.

Disposed in the open lower end of the stationary member 1 is a disc 27 which is a free sliding fit within the recess in the stationary member 1 in which a pressurised aerosol dispensing container 24 with its protruding valve 25 is shown in dotted lines.

The disc 27 is disposed to engage with the bottom surface of the container 24 so that, on axial movement upwardly, it will push the container in a direction to actuate the valve 25 so as to discharge the contents through the orifice 6.

In order to effect the movement of the disc 27, two toggle connections 28 are provided which connect the disc 27 to each of the two movable members 26. The precise construction of this part of the device is more readily followed from the larger scale illustration seen in Figure 9. It will be seen that the disc 27 is formed with two slots each of which terminate in a part cylindrical trough 31, a similar trough 32 being formed in the bottom surface of the movable members 26 to receive the bulbous edge 29 and 30 respectively of the toggle members 28. The dimensions of the bulbous portions 29 and 30 are such that they provide a snap-fit into the troughs 31 and 32 between the surfaces 33 and 34 and 35 and 36 respectively in the member 26 and 27.

It will be seen that the surfaces 33 and 35 are parallel with the central longitudinal axis of the stationary member 1 whilst the surfaces 34 and 36 are disposed at an angle thereto. In the position shown in Figure 9 the toggle members 28 lie against the surfaces 34 and 36 and thus the further movement outwardly of the members 26 is prevented. When the two members 26 are moved towards one another, the toggle members will push the disc 27 upwardly and the limit of movement is defined by the toggle members 28 coming into contact with the surfaces 33 and 35 respectively, thus defining the maximum movement of the members 26 and the disc 27. The two toggle members are formed of a strip of material whose two opposite edges are formed as cylindrical bulbous edges 29 and 30 referred to above.

It will be readily understood that the several parts of the actuator may be made from any convenient material capable of being readily moulded and may be either metal or a synthetic resin.

It will be appreciated that with all of the constructions above described and illustrated, a transverse movement of the movable member or members will effect actuation of the valve of the container by reason of the container being forced axially of the stationary member by the use of the inclined cam surfaces, or by the cam action of the bar and the inclined slots or by the toggle action in the third embodiment described.

WHAT WE CLAIM IS:—

1. An actuator for pressurised aerosol dispensing containers which have a discharge valve actuated by axial displacement of a valve stem, comprising an elongated stationary member formed with a recess adapted to receive and locate a pressurised aerosol dispensing container, a movable member mounted on said stationary member and arranged to be movable transversely of the longitudinal axis thereof, by means of a squeezing action on the stationary and movable members where they surround the dispensing container, and conversion means adapted to convert transverse movement of said movable member into axial movement to exert pressure on said container along the longtudinal axis of the said stationary member to move it axially thereof, said stationary member having an abutment at or near the upper end of the recess to engage with the stem of the valve of the container to retain it against axial movement during axial movement of the container.

2. An actuator according to claim 1 wherein said conversion means comprises cam means carried on, or actuated by, said movable member, said cam means being so located as to engage the base of a pressurised aerosol dispensing container held in the stationary member and adapted to push it axially thereof.

3. An actuator according to claim 2 wherein said cam means is constituted by a wedge-shaped member carried on the lower end of the movable member.

4. An actuator according to claim 2 wherein said cam means is constituted by slots formed in the elongated stationary member and movable member, said slots being disposed at an angle to one another and having a bar engaging with both slots and passing transversely across the lower end of the elongated stationary member in a position to engage with the base of the container, the slots being so arranged that, on transverse movement of the movable member towards the centre of the elongated stationary member, the bar is caused to move towards the upper end of the elongated stationary member pushing a pressurised aerosol dispensing container disposed therein axially towards the upper end, by virtue of the sliding motion of the bar in the two slots.

5. An actuator according to claim 4 wherein said bar is provided with a flat disc adapted to abut against the base of a pressurised aerosol dispensing container.

6. An actuator according to claim 1 wherein said conversion means comprises a base plate positioned within the recess in said stationary member to engage the base of a pressurised aerosol dispensing container disposed therein and toggle means connceting said base plate and said movable member.

7. An actuator according to claim 6 wherein a second movable member is pro-

vided which is also mounted on said stationary member, said second movable member being alsco connected to the base plate by a toggle member.

8. An actuator according to claim 6 or claim 7 wherein the toggle member is formed by a strip of rigid material formed at opposed edges with a bulbous section adapted to fit in arcuate grooves formed in the base plate and said movable member.

9. An actuator according to claim 8 wherein the groove in the movable member is formed with angled entry faces constituting limiting abutments defining the limits of angular movement of said toggle member.

10. An actuator for pressurised aerosol dispensing containers according to any of the preceding claims wherein the stationary and movable members are moulded from metal or synthetic resin.

11. An actuator for pressurised aerosol dispensing containers substantially as described with reference to Figures 1 to 4 of the accompanying drawings.

12. An actuator for pressurised aerosol dispensing containers substantially as described with reference to Figures 5 and 6 of the accompanying drawings.

13. An actuator for pressurised aerosol dispensing containers substantially as described with reference to Figure 7 of the accompanying drawings.

14. An actuator for pressurised aerosol dispensing containers substantially as described with reference to Figures 8 and 9 of the accompanying drawings.

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Agents for the Applicants.

Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd.—1967.
Published at the Patent Office, 25 Southampton Buildings, London, W.C.2 from which copies may be obtained

Fig.1

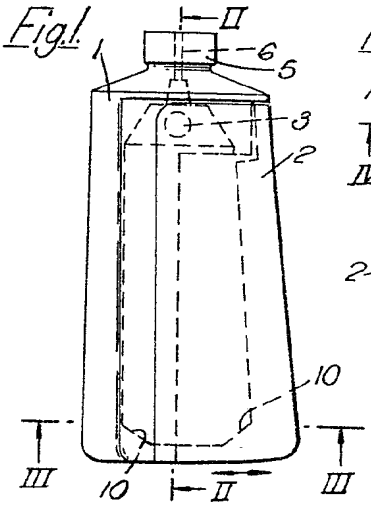



Fig.2

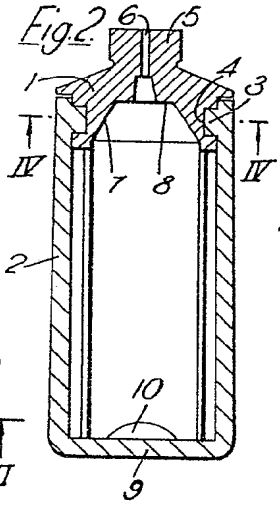



Fig.3

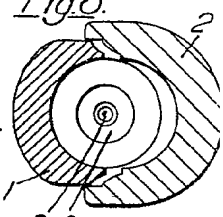



Fig.4

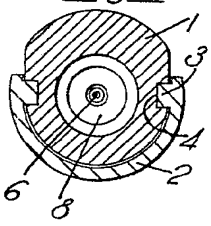



Fig.5

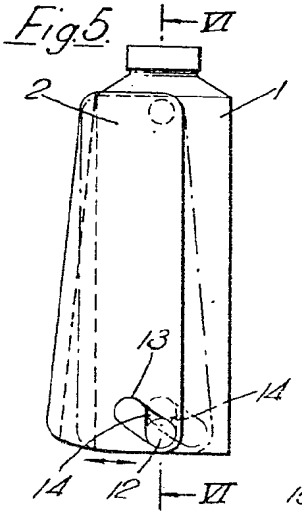



Fig.6

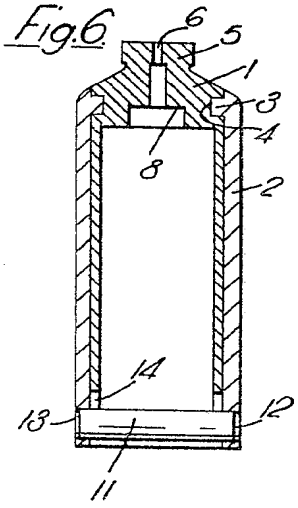
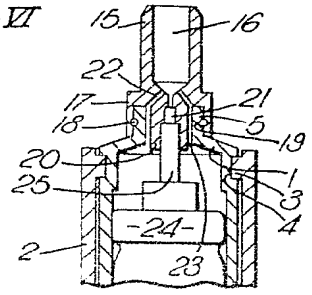



Fig.7



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2 SHEETS

COMPLETE SPECIFICATION

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Fig. 8.

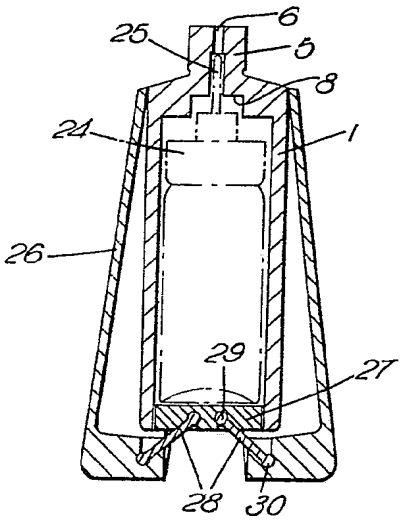
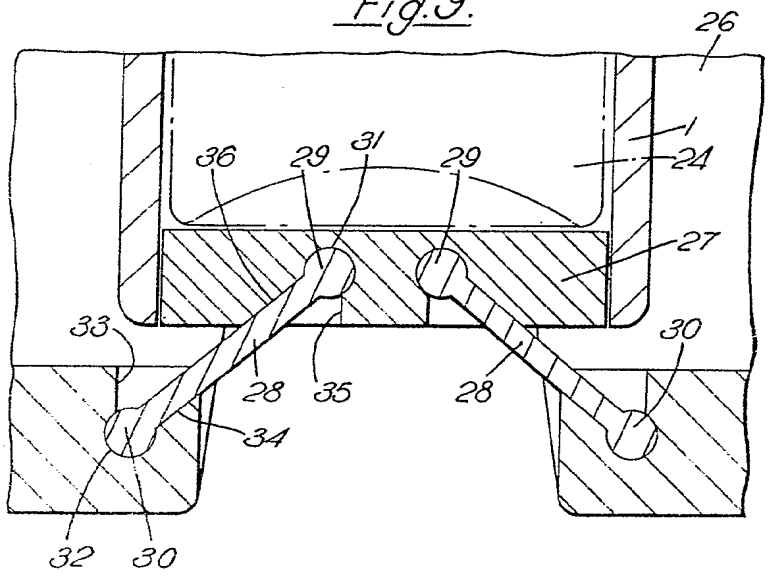



Fig. 9.



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SHEETS 1 & 2

Fig.1.

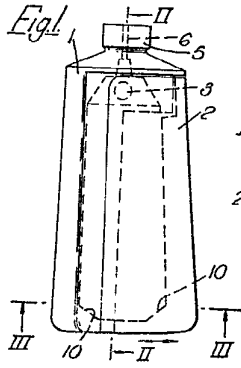


Fig.2.

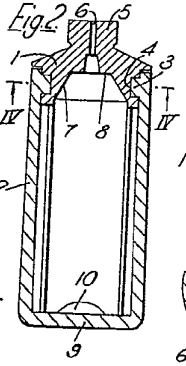


Fig.3.

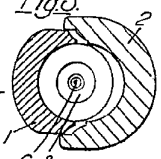


Fig.4.

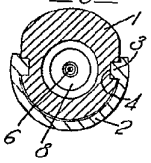


Fig.5.

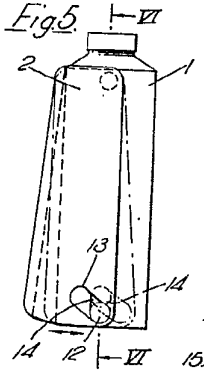


Fig.6.

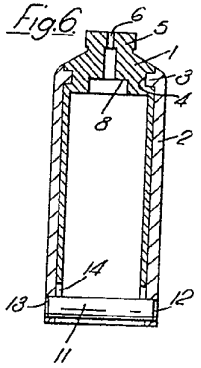


Fig.7.

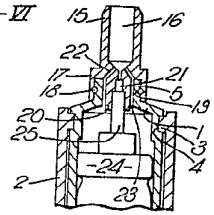


Fig.8.

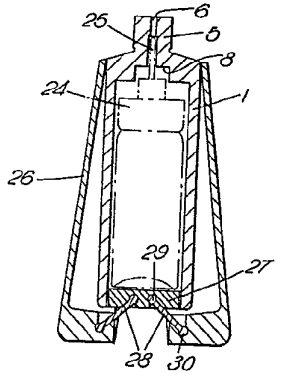


Fig.9.